



Total Maxillectomy

A review

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Maxillectomy a review

Introduction:

The concept of maxillectomy was first described by Lazars in 1826. After this description it took nearly three years for Syme to perform the first maxillectomy (1829). Earlier attempts at this surgery failed because of excessive bleeding. Bleeding and infection were two scrooges which caused unacceptable morbidity and mortality in patients following maxillectomy. In 1927 Portmann & Retrouvey suggested sublabial transoral approach to remove maxilla. This approach obviated the use of disfiguring facial incisions. Rapid advances which took place in the field of anesthesia and surgical techniques in 1950 rekindled the interest in total maxillectomy as a viable treatment option for malignant lesions involving maxilla. It was during this period that Weber Ferguson came out with his epoch making lateral rhinotomy incision which caused very little cosmetic deformity. Later various modifications of these incisions were used to perform maxillectomy.

In 1954 Smith did what was considered impossible. He combined total maxillectomy with orbital exenteration. It was only after Smith's demonstration of extended total maxillectomy curative surgery for maxillary carcinomas began to take center stage. Fairbanks & Barbosa (1961) described infratemporal fossa approach to resect advanced malignancies of maxilla. These tumors were considered to be inoperable till then.

In 1977 Sessions & Larson first envisaged medial maxillectomy and were also responsible for coining the term. With the advent of nasal endoscope resection of tumors involving lateral nasal wall under endoscopic vision is the order of the day.

Indications for maxillectomy:

1. Malignant tumors involving maxilla / lateral nasal wall
2. Fungal infections causing extensive destruction of sinuses
3. Chronic granulomatous diseases involving nose and sinuses
4. As a part of combined excision of skull base neoplasm

Partial maxillectomy procedures are indicated in patients with:

1. Slow growing tumors involving nose and sinuses (inverted papilloma)
2. Tumors localized to inferior wall of maxilla

Contraindications:

1. Poor general condition
2. Medically amenable malignancies like lymphoma / rhabdomyosarcoma
3. Systemic disorders like uncontrolled diabetes / decompensated heart
4. Bilateral tumor with bilateral orbital involvement. Removal of bilateral tumors is not only a surgical challenge but also a challenge to design appropriate prosthesis. Moreover if both orbits are involved then bilateral orbital exenteration cannot be performed lest the patient will be left blind.

Important considerations before deciding on surgery:

1. Extent of the lesion
2. Histopathology of the lesion
3. Involvement of adjacent areas
4. Precise location of the bulk of the mass

Role of Nasal endoscopy and clinical examination:

This is really vital in deciding not only the extent of the disease but also in determining the optimal treatment modality. It also helps in discussing prognostic issues with the patient and their near ones.

Role of nasal endoscopy:

It helps in examination of the nasal cavity and also provides the first look at the disease process from which biopsy can be done. Spread of lesion outside the confines of maxilla by eroding the antero lateral wall can be ascertained by careful palpation of the anterior wall and in assessing the integrity of the function of the inferior orbital nerve. Erosion of the posterior wall of maxilla with extension of lesion to pterygopalatine fossa can be ruled out clinically by absence of trismus.

Histopathological diagnosis is a must before deciding on the optimal management modality. If tumor histology is suggestive of lymphoreticular tumors / rapidly proliferating embryonal tumor like rhabdomyosarcoma then irradiation is the preferred treatment modality.

Role of imaging:

1. Both axial and coronal CT will have to be performed in order to ascertain the extent of the lesion.
2. Imaging also helps in deciding the optimal osteotomy location during surgery. The level of frontoethmoidal suture line should be identified well in advance. Superior osteotomy above this level will cause intracranial injury and CSF leak.
3. MRI is indicated in patients who have skull base erosion in order to identify intracranial extension.

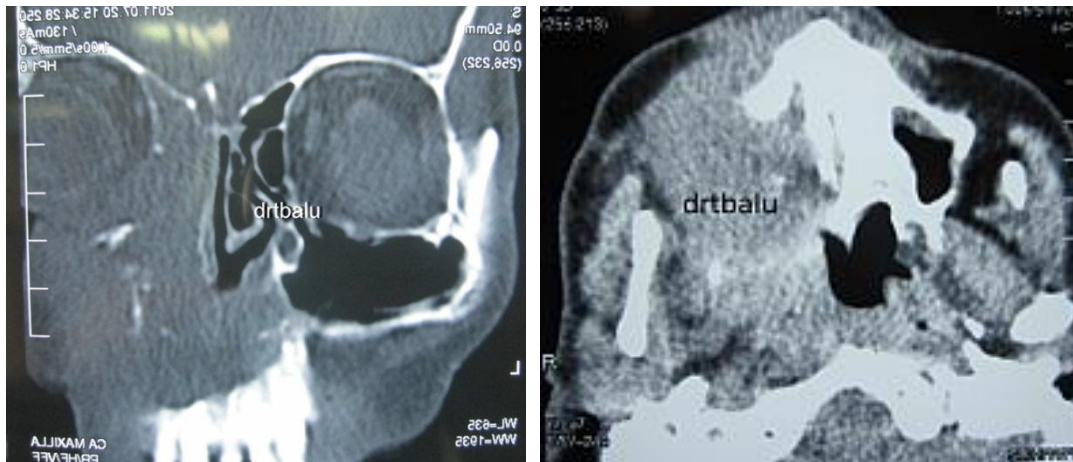
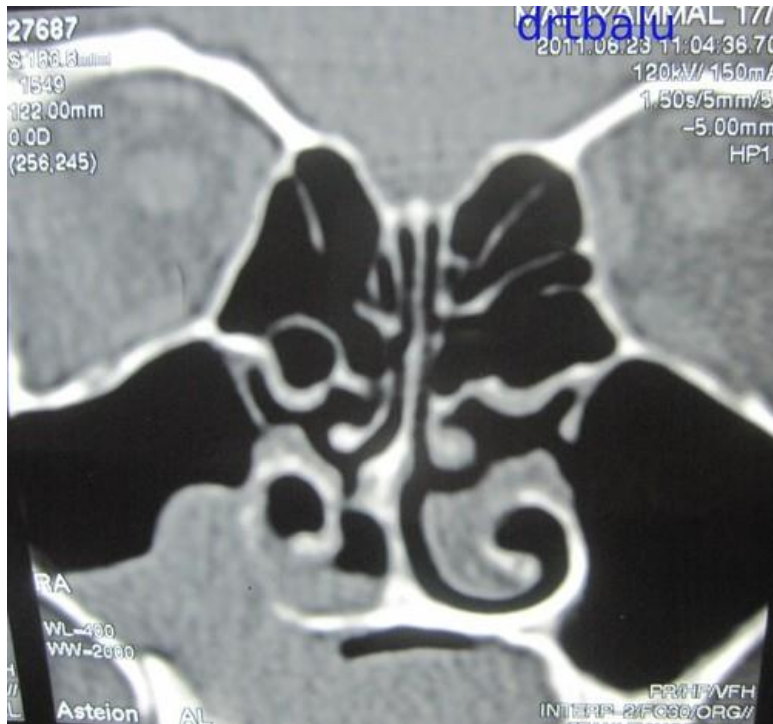


Figure showing Coronal and Axial CT showing Growth involving right maxilla eroding its medial, inferior and antero lateral walls. Axial CT shows the same mass eroding posterior wall of maxilla extending on to pterygopalatine fossa. Pterygoid process is not visible on right side ? eroded.



Coronal CT nose and sinuses showing soft tissue shadow involving inferior portion of maxilla with erosion of the floor of maxilla

Role of prosthodontist:

Preoperatively prosthodontist should examine the patient and design an optimal prosthesis which is actually a temporary one. This can be fixed immediately after surgery. Final prosthesis can be fitted after the completion of treatment which includes irradiation / chemotherapy.

Role of ophthalmologist:

Ophthalmic examination helps in ruling out ocular involvement. If orbit is involved then maxillectomy will have to be combined with orbital exenteration.

Procedure:

This surgery is ideally performed under general anesthesia. Administration of pre-operative antibiotics has been considered to reduce incidence of post op infections. Ideally it should be a broad spectrum antibiotic which could cover the normal flora of nasal and oral cavities.

The question whether tracheostomy should be performed or not is determined by the extent of lesion and the amount of palate that needs to be removed. If large amount of palatal tissue needs to be removed to give adequate tumor margins then it is safer to resort to preliminary tracheostomy. Advantages of preliminary tracheostomy include:

1. Anesthesia can be administered through it
2. Provides unhindered view of oral cavity which is helpful during oral phases of surgery
3. It helps to secure airway during post op period even in the presence of intra oral oedema

Tarsorrhaphy is performed on the side of lesion. This helps in protecting eye and cornea from injury. Lateral tarsorrhaphy alone could suffice if it could provide adequate eye closure. Ideally silk is used to perform this procedure. Before performing tarsorrhaphy it would be prudent on the part of the surgeon to apply eye ointment in order to prevent excessive drying of cornea.

Ryles tube insertion:

This is ideally performed before anesthetizing the patient. Ryles tube in position will help in feeding the patient during the initial post-operative period. Even though it is not a must if inserted serves a good purpose.

Hypotensive anesthesia can be administered if there is no contraindication as it would help in minimizing blood loss during the procedure. If endotracheal intubation is preferred to tracheostomy then oral intubation is ideal. The endotracheal tube should be secured to the side opposite to that of the tumor. It is anchored to the lower lip without distorting the upper lip.

Position:

Patient is put in supine position with head turned 180° from the anesthetist.

Incision:

Even though various incisions are available author prefers to use Weber Ferguson incision and its various modifications. Modifications of Weber Ferguson incision is necessary if other areas like orbit needs to be attended. Lateral canthotomy can be combined with Weber Ferguson incision to expose orbital boundaries and malar area. Lip splitting incision a modification of Weber Ferguson incision is preferred if infratemporal fossa is involved.



Photograph showing the Weber Ferguson Lip splitting incision used in maxillectomy.

Weber Ferguson incision:

Before actually beginning the process of incision the area should be marked and infiltrated with 1% xylocaine with 1 in 100,000 units adrenaline. This infiltration if done properly will help in minimizing intraoperative bleeding during surgery.

The modified Weber Ferguson incision used in total maxillectomy has three components.

1. Curving incision from the medial canthus to the ala of the nose at the nasolabial sulcus.
2. This incision is rounded inferiorly along the upper border of upper lip till the center of the lip is reached. The upper lip is ideally split right in the midline.
3. Infraorbital component of the incision passes about a couple of millimeters from the lower eye lid margin till the malar eminence is reached.

Whatever may be the type of incision used the skin is slit right through till periosteum is reached. This enables cheek flap to be elevated from the antero lateral surface of maxilla in the subperiosteal plane. If the anterior wall of maxilla is eroded by the mass with skin involvement

then dissection is slightly altered so that the involved skin overlying the anterolateral wall of maxilla is also removed en bloc along with the tumor.

Probable bleeding sites encountered during this incision:

1. Angular vein close to the inner canthus of eye. If not ligated properly may cause irksome ooze during surgery.
2. When lip is being split right in the middle labial vessels may lead (superior labial artery)
3. Infra orbital vessels when infraorbital limb of the incision is being made.

Infraorbital nerve is sacrificed after taking a biopsy from it to rule out perineural invasion. This is mandatory in all patients with adenocarcinoma of maxilla. Adenocarcinoma has a propensity to spread via nerve sheaths.

After elevating the cheek flap, the inferior and medial periorbital areas are elevated exposing the following areas:

1. Floor of orbit
2. Lacrimal fossa
3. Lamina papyracea

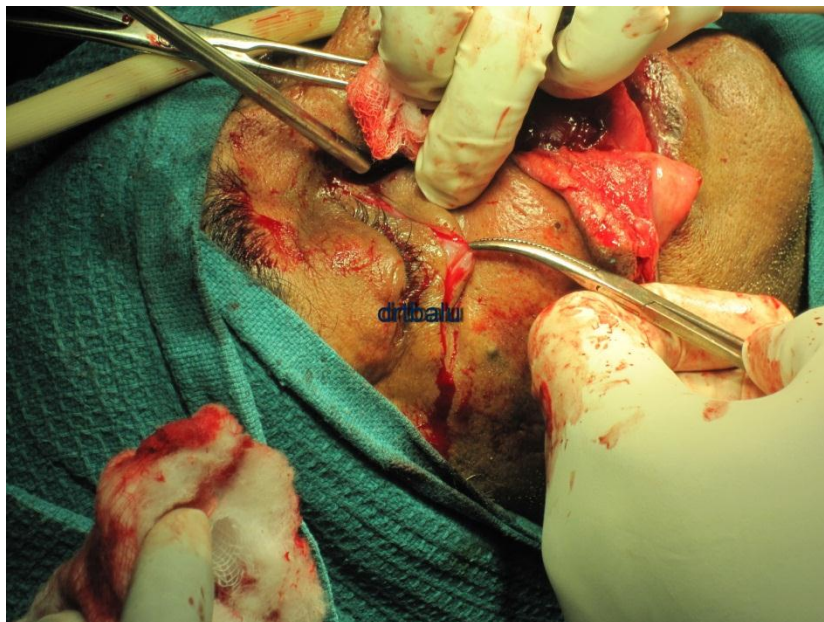
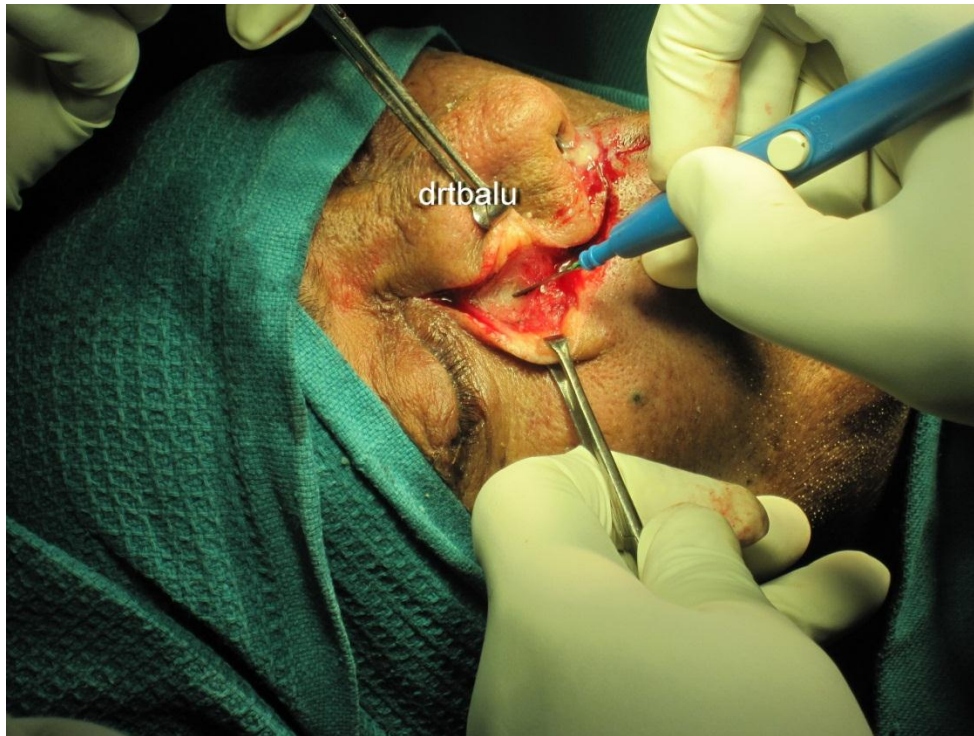


Figure showing infraorbital limb of the incision



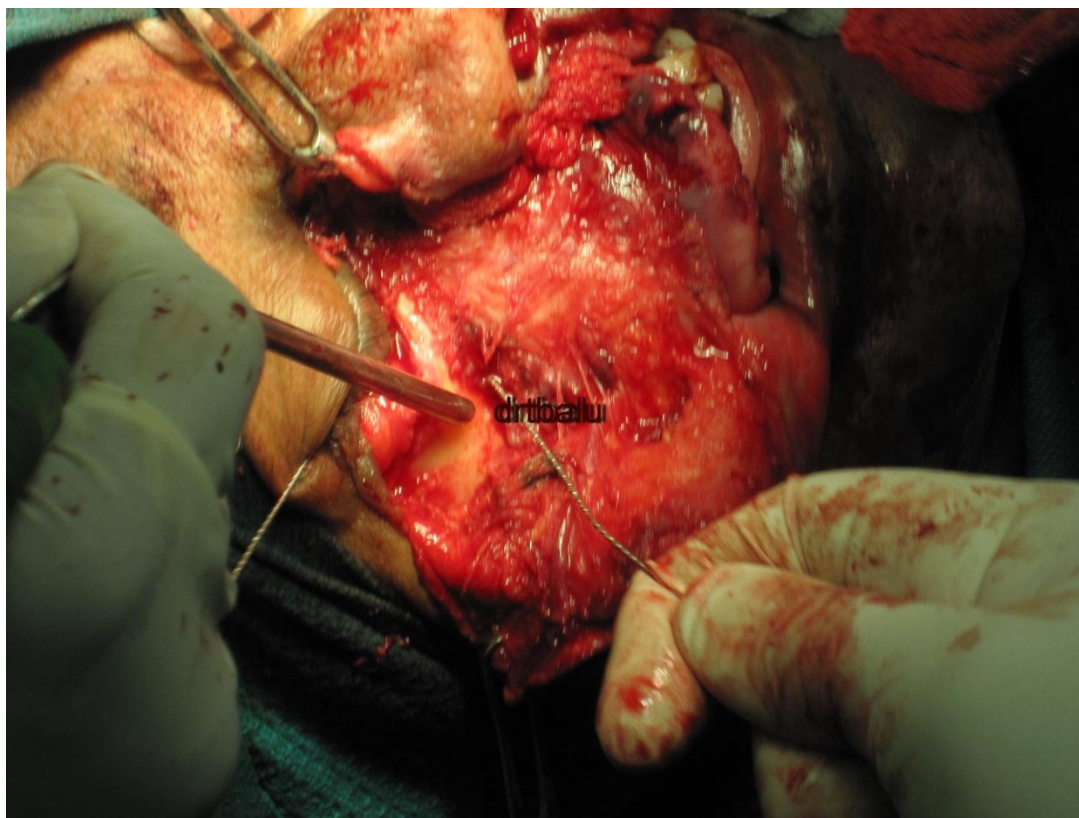
Incision is ideally deepened up to the subperiosteal plane by using diathermy cautery. Use of cautery minimizes bleeding to a great extent

Identification of lacrimal sac and duct:

The lacrimal sac is identified, dissected and retracted. This maneuver stretches and exposes the lacrimal duct. The nasolacrimal duct is usually transected at its junction with the sac. The sac is marsupialized. This is performed by dividing the sac and suturing the edges to the periorbita. This is a critical step during the procedure as it gives excellent opportunity to the surgeon to identify orbital involvement. If periorbita is breached by the tumor then it calls for histological confirmation of orbital involvement. Frozen section will be used during this stage of the procedure.

Transection of infraorbital rim:

This is transected laterally at the malar buttress. Gigli's saw may be useful during this phase of surgery.



Picture showing transection at the level of malar buttress using Gigli saw

Tip: While using gigli saw during osteotomy procedures, saline should be dripped on the surgical field continuously to prevent tissue damage due to overheating which could occur during this procedure.

The medial orbital rim is transected just below the frontoethmoidal suture line. Above this line dura is present. In tumors involving roof of ethmoid (Fovea) require skull base resection in order to provide adequate tumor margins. If fovea is not involved by the disease then ethmoid bone is removed along the frontoethmoidal suture line to provide adequate exposure.

Tip:

While performing the superior cuts please ensure that it is done in a direction parallel to the nasal floor in order to avoid inadvertent entry into skull base.

Intraoral phase of surgery:

Palatal incision:

Incision is made over the hard palate from just posterior to the lateral incisor till the junction with that of soft palate is reached. Incision is deepened up to the level of periosteum. At the junction of soft palate the incision curves horizontally and extended up the maxillary tuberosity where it is rounded.

Tip: Bleeding will be minimized if this area is also infiltrated with 1% xylocaine mixed with 1 in 100,000 units adrenaline

Division of hard palate:

This is usually done using an osteotome / reciprocating saw. Author prefers to use osteotome. Palatal division is started about 2-3 mm from the ipsilateral nasal septum (if tumor margin permits). This can be modified to suit tumor margins. Lateral incisor if present and uninvolved it can be preserved for prosthesis fitment purposes. The central incisor can be compromised. It is easy to use osteotome from the cavity of central incisor after removing it.

After completing palatal osteotomy the soft tissue attachments between hard and soft palate are freed using sharp dissection / unipolar diathermy cautery.

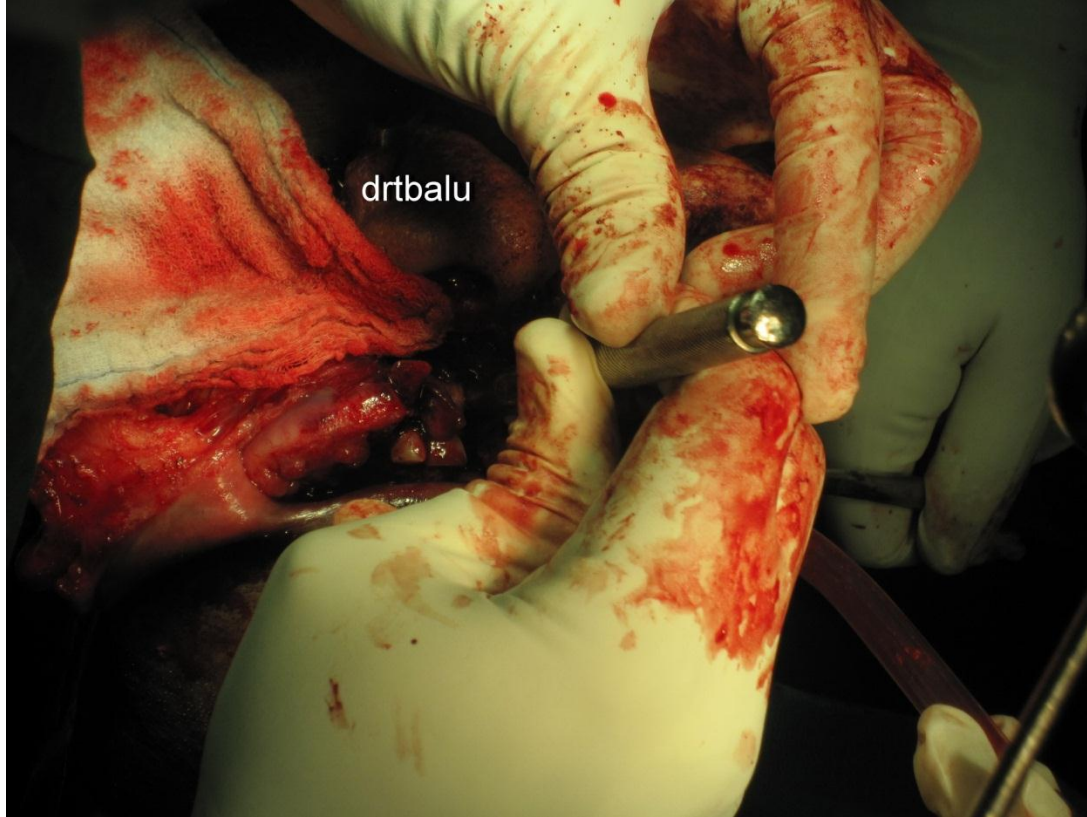


Image showing osteotome being used for palatal resection

Osteotomies over lateral orbital wall and posterior floor of orbit are completed thereby allowing down fracture of maxilla. The only attachment remaining at this state is the pterygoid plate. Attachment of maxilla to pterygoid palate can be removed using a curved osteotome. Maxilla can now be freed by lateral rocking movements. At this stage brisk bleeding may be encountered. This is usually due to internal maxillary vessels and pterygoid plexus. Packing the entire area using a hot pack will help in controlling bleeding. Majority of this bleeding reduces appreciably with hot packing. In the event of hot packing failing to control bleeding then individual vessels will have to be cauterized using bipolar cautery.

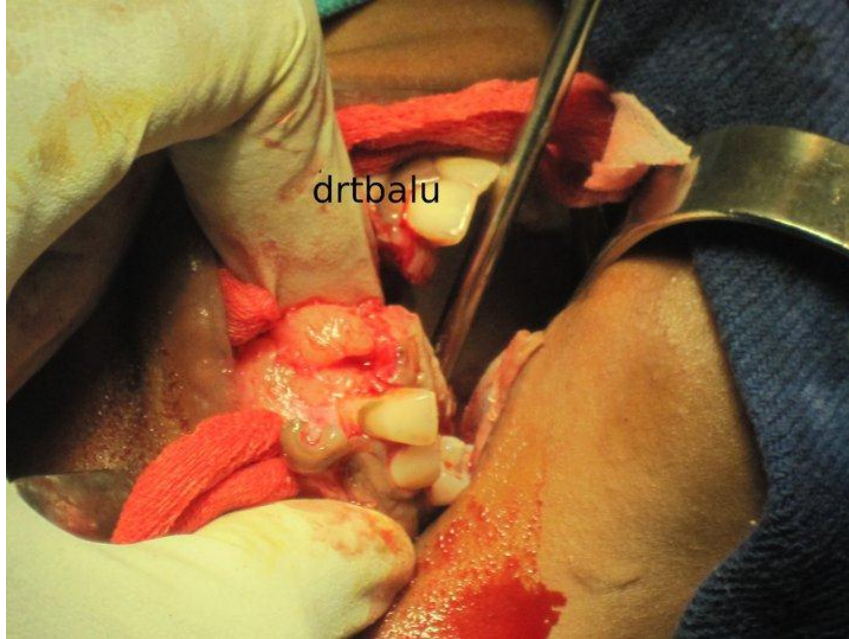


Image showing disarticulation of maxilla by gentle lateral rocking movements



Image showing hot pack in position after removing the entire maxilla



Image showing gross maxillectomy specimen

After the entire maxilla is removed the area is washed with saline and betadine solution. Temporary prosthesis is inserted. Gutta percha is used to fashion this prosthesis. It is always optimal to have a prosthodontist to do this job.

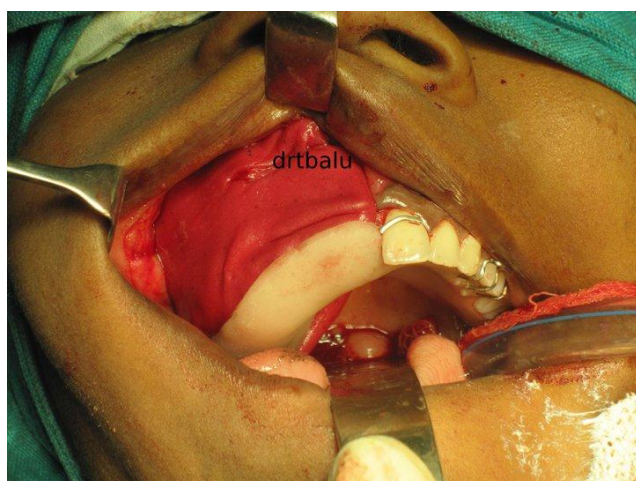


Image showing obturator in place

Bone cuts a pictorial review:

It will not be out of place to review the bone cuts performed in total maxillectomy from osteology point of view. Pictures below will give a clear cut view of various osteotomies performed before maxilla could be disarticulated.



Color plates showing various bone cuts marked over the skull

Wound closure:

This is ideally done in layers.



Wound closure

Complications:

1. Intraoperative hemorrhage
2. Troublesome Epiphora
3. Damage to orbital structures
4. Damage to cornea
5. Visual disturbances
6. Loss of vision due to over packing the maxillectomy cavity compromising vascularity of optic nerve
7. Velopharyngeal incompetence (Nasal leak of ingested fluids)
8. Cosmetic defects / scars
9. Trismus due to scarring of muscles of mastication